CLAIMS

We claim:

1. A camshaft, comprising:

   a. a plurality of bearing means, wherein each of said bearing means has a corresponding lubrication supply conduit;

   b. a hollow camshaft rotatably journalled in said plurality of bearing means; and

   c. a plurality of camshaft lubrication supply ducts, wherein each said camshaft lubrication supply duct traverses a journal surface of said hollow camshaft and an interior surface of said hollow camshaft, and wherein each said camshaft lubrication supply duct rotatably aligns with said corresponding lubrication supply conduit, whereby lubricant transfers from said corresponding lubrication supply conduit to the interior of said hollow camshaft;

   d. a first cam lobe having a cam surface, wherein said first cam lobe has a location on said hollow camshaft adjacent to said journal surface on said hollow camshaft;

   e. a first cam surface lubrication supply duct traversing said cam surface of said first cam lobe and said interior surface of said hollow camshaft wherein said first cam surface lubrication supply duct has an aperture located on said cam surface of said first cam lobe, and wherein said camshaft lubrication supply duct has an aperture located on said journal surface of said hollow camshaft, and wherein said aperture located on said cam surface of said first cam lobe and said aperture located on said journal surface of said hollow camshaft have an angular displacement about the rotation axis of said hollow camshaft of between zero degrees and about thirty degrees.

2. A camshaft as described in claim 1, further comprising a second cam lobe having a cam surface, wherein said second cam lobe has a location on said hollow camshaft adjacent to said journal surface on said hollow camshaft.

3. A camshaft as described in claim 2, further comprising a first cam surface lubrication supply duct traversing said cam surface of said second cam lobe and said interior surface of said hollow camshaft.

4. A camshaft as described in claim 3, wherein said first cam surface lubrication supply duct traversing said first cam lobe has an aperture located on said cam surface of said first cam lobe, and wherein said first cam surface lubrication supply duct traversing said second cam lobe has an aperture located on said cam surface of said second cam lobe, and wherein said camshaft lubrication supply duct has an aperture located on said journal of said hollow camshaft, and wherein said aperture located on said cam surface of said first cam lobe and said aperture located on said cam surface of said second cam lobe have an angular displacement about the rotation axis of said hollow camshaft approximately bisected by said aperture located on said journal of said hollow camshaft.

5. A camshaft as described in claim 4, further comprising:

a. a second cam surface lubrication supply duct traversing said cam surface of said first cam lobe and said interior surface of said hollow camshaft; and

b. a second cam surface lubrication supply duct traversing said cam surface of said second cam lobe and said interior surface of said hollow camshaft.

6. A camshaft as described in claim 5, wherein said first cam surface lubrication supply duct has a first aperture location on said cam surface, and wherein said second cam surface lubrication supply duct has a second aperture location on said cam surface, and wherein the circumference of said aperture having said first aperture location and the circumference of said aperture having said second aperture location are separated by a distance of not less than about one aperture diameter.

7. A camshaft as described in claim 6, further comprising a plurality of said camshaft

lubrication supply ducts.

8. A camshaft as described in claim 7, wherein each said cam surface lubrication supply duct is differentially configured to supply an amount of lubricant to substantially equalize wear of a plurality of cam surfaces.

9. A camshaft as described in claim 8, further comprising a seal element coupled to an end of said hollow camshaft, wherein said seal element has a vent hole communicating between the interior surface and the exterior surface of said seal element.

10. A camshaft as described in claim 9, wherein said vent hole has a location along the longitudinal axis of said hollow camshaft.

11. A camshaft as described in claim 10, further comprising a lubrication pressurization element coupled to said lubrication supply conduit.

12. A camshaft as described in claim 11, further comprising a lubricant responsive to said lubrication pressurization element.

13. A camshaft as described in claims 1, 4, 6 or 7, further comprising:

a. a block having a least one cylinder;

b. a reciprocal means slidingly engaged to the surface of said cylinder;

c. a reciprocal movement to rotational movement conversion element rotatably responsive to said reciprocal means and rotatably journal led in bearings;

d. a cylinder head coupled to said block;

e. at least two conduits communicating with each of said at least one cylinder; and

f. at least one valve coupled to each of said at least two conduits, wherein said at

least one valve is operationally responsive to said cam surface of said cam lobe of said hollow camshaft.

14. A camshaft as described in claim 13, wherein said engine comprises an automobile engine.

15. A camshaft as described in claim 13, wherein said engine comprises an aircraft engine.

16. A method of lubricating a camshaft, comprising the steps of:

a. supplying lubricant to a plurality of bearing means each having a corresponding lubrication supply conduit;

b. rotating a hollow camshaft journalled to said bearing means to align at least one camshaft lubrication supply duct with each said lubrication supply conduit, wherein said at least one camshaft lubrication supply duct traverses a journal surface and an interior surface of said hollow camshaft; and

c. supplying lubricant to said interior surface of said hollow camshaft through each of said at least one lubrication supply duct; and

d. rotationally displacing said camshaft lubrication supply duct and a cam surface lubrication supply duct between about zero degrees and thirty degrees about the rotation axis of said hollow camshaft, wherein said cam surface lubrication supply duct traverses a cam surface of a first cam lobe adjacent to said journal led surface of said hollow camshaft.

17. A method of lubricating a camshaft as described in claim 16, further comprising the step of approximately bisecting the rotational displacement of said cam surface lubrication supply duct on said first cam lobe adjacent to said journal led surface of said hollow camshaft and a cam surface lubrication supply duct on a second cam lobe adjacent to said journal led surface of said hollow camshaft with the location of said

camshaft lubrication supply duct.

18. A method of lubricating a camshaft as described in claim 17, further comprising the steps of traversing said first cam lobe with a second cam surface lubrication supply duct.

19. A method of lubricating a camshaft as described in claim 18, further comprising the step of angularly displacing said cam surface lubrication supply duct and said second cam surface lubrication supply duct about the rotation axis of said camshaft an amount equal to about one aperture diameter of said cam surface lubrication supply duct.

20. A method of lubricating a camshaft as described in claim 19, further comprising the step of differentially configuring each said cam surface lubrication duct to supply an amount of lubricant sufficient to equalize wear of a plurality of cam surfaces.

21. A method of lubricating a camshaft as described in claim 20, further comprising the step of sealing each end of said hollow camshaft.

22. A method of lubricating a camshaft as described in claim 21, further comprising the step of ventilating said hollow camshaft, wherein ventilating said hollow camshaft comprises the step of traversing the exterior surface and said interior surface of a camshaft end seal with a hole.

23. A method of lubricating a camshaft as described in claims 16, 17, 18, 19 and 20, further comprising the step of utilizing said hollow camshaft in an engine.

24. A method of lubricating a camshaft as described in claim 23, further comprising the step of operating said camshaft in said engine from horizontal.

25. A method of lubricating a camshaft as described in claim 24, wherein said step of operating said camshaft in said engine from horizontal comprises operating said camshaft at a pitch selected from the group consisting of 5 degrees, 10 degrees, 15, degrees, and 20 degrees.